Response to Ofgem's discusion paper on 'Non-traditional busines models: Supporting transformative change in the energy market.'

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Foreword

Researchers at the Sussex Energy Group in SPRU, University of Sussex, are driven by an interest in prospects for a more sustainable energy future. Our primary focus is on the processes of innovation, technological and social, that will contribute to this objective, using a range of multi-disciplinary social science approaches. Over many years our researchers have developed expertise on community energy, energy services, infrastructure transitions and, through our work in the Centre on Innovation and Energy Demand (CIED), end-use energy demand and energy efficiency. We hope to make a make a valuable contribution to Ofgem's discussion paper on 'Non-traditional business models: Supporting transformative change in the energy market by presenting insights from recent SPRU, Sussex Energy Group and CIED research and signposting other relevant academic work related to NTBMs.

We started the process of engagement on this topic in February 2015 when researchers in the CIED organised a seminar and workshop with Dr Jeff Hardy, Head of Sustainable Energy Strategy at Ofgem. The event was well attended by researchers, students and several representatives from local energy co-operatives including OVESCO, Community Energy South and Brighton Energy Co-op.

Researchers within SPRU, the Sussex Energy Group and CIED have drafted this document as a more comprehensive response to the Ofgem discussion. We hope it provides useful input to the process.

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Questions:

CHAPTER: One

What is your view on our definition of non-traditional business models?

The aim of this consultation to examine alternative approaches to the business of electricity and gas delivery is timely and well-placed. We welcome Ofgem's consultation on the changing energy market, as new and varying types of organisations are entering. Inevitably, this is challenging the dominance of the Big Six, which ultimately also means more options and opportunities not only for consumers but for new sustainable businesses alike. The concept of non-traditional business models helpfully provides a solution-neutral term whilst focusing attention on ways of doing business in this sector that differ from conventional generation, distribution and supply.

However, we propose the following amendments and reasoning for their consideration:

1) To remove the last statement "have the potential to transform the existing energy system" from the definition. While this is the hope and the most important reason for being interested in NTBM's, it is difficult to tell *a priori* whether any particular business model will have this effect and therefore makes it a definition which is difficult to use in practice.

2) To include the text in footnote 2 as part of the definition in the main text.

3) To consistently include energy efficiency and demand side response as equally important options (as the further explanation of the definition in 1.6) alongside energy generation and supply in the definition of NTBMs, rather than being summarised as 'other energy services'.

4) To amend the definition of NTBMs to also include new ways of capturing and/or creating value within a company, and in the case of public ownership, with society and the market (in the case of public ownership). In the management literature the term business model refers to how a firm (a)

creates value and (b) captures value. In more general use it refers to the framework through which firms create, deliver, capture and monetize value. It defines what it is that a company does to create value for its customers and how the company goes about turning some of that value into current and future profits. It is important to note that firms typically only capture a small amount of the value they create. Moreover, the value that is created is not always economic. Hence a firm may create and capture value for itself in terms of learning or increased market reputation. Similarly, a firm may create, (and sometimes not capture) significant non economic value for society. This non-economic value is particularly important in infrastructure settings, which are often regulated to ensure these non-economic values are provided to society. Interest in business models reflects a move away from only focusing on how firms can provide benefits to their customers to consider how that ability to deliver value co-evolves with an ability to capture some of that value and turn it into revenue streams. However, publically owned companies tend not to capture value within the organisation but pass it on to society, or capture value indirectly through the facilitation of economic growth and the maintenance of public satisfaction. Business models therefore provide a way for regulators to think about how industries evolve, and also how different kinds of economic and non-economic value are socially distributed.

5) To amend the definition of NTBMs so that it distinguishes between new business models and other innovations. The term business model innovation refers to a change in the way value is created and/or appropriated (see for example Teece[1], 2006). Although new business models can accompany other innovations, for example in product or process, business model innovation can occur independently of and is separate from such innovations. A definition that decouples business model change from accompanying innovations provides the opportunity to identify different motivations for/consequences of business model change. Examples of different roles for changes in business

[1] Teece, D.J., 2006, 'Reflections on "Profiting from Innovation"', Research Policy, 35 (8), 1131-46

[2] Such a ‘frontrunner desk’ was successfully established as part of the Dutch energy transition

models feature in the consultation document and there are several reasons for NTBM introduction that can be envisioned for the energy market. These include process innovations enabling new ways of distributing value in the supply chain, for example changes to the wholesale market. A new business model might allow additional gains to be made from a new technology, including allowing the success of a technology that would not pay off under the existing business models being used in a market (e.g. localised production of renewable energy). Business model changes can also accompany a change in focus, for example fulfilling new customer needs or defining the customer differently (e.g. non-traditional business models focused on vulnerable consumers or seeking to increase the sustainability performance of energy provision). Breaking down the concept of NTBMs in this way (considering the process/reasons for their entry into the market) could assist in the analysis of their place and potential influence in the energy sector above and beyond the broad themes already observed in the energy market.

How we can engage with NTBMs more effectively in the future?

1) By providing consistency in the treatment of NTBMs. In its present form, the discussion paper partly sends mixed messages about Ofgem's aim to engage with and support new business models. The text several times refers to 'avoid standing in the way' which can be interpreted as a rather passive stance with little desire to engage more effectively with NTBMs, as opposed to taking a more active stance in supporting the emergence and diffusion of new business models in order to achieve energy system change and increase competition.

2) Outline concrete steps for further engagement with NTBMs in the future. Potential ideas might include:

- Having a dedicated unit/contact person within Ofgem, responsible for collating evidence on the regulatory barriers to NTBMs and for finding solutions;[2]

[2] Such a 'frontrunner desk' was successfully established as part of the Dutch energy transition programme and its main task "is to assist small, innovative companies that get stuck in the quagmire

- Setting up an informal group between Ofgem and representatives of NTBMs to reflect on existing regulatory and policy barriers and what Ofgem can proactively do to support the emergence and diffusion of NTBMs[3];

- Funding a short-term project on how to better engage with NTBMs (incl. looking at experience from other regulatory agencies, either in the UK or abroad);

- Organising events specifically designed to engage NTBMs.

- Increasing the visibility of NTBMs. Although the consultation document refers to NTBMs crossing sector boundaries (bundling innovations), including areas that are not regulated by Ofgem, the focus of the discussion is on the existing firms, practices and customers of the electricity and gas markets. Definitions of the product, customer and the concept of value can change alongside changes in business models. This means that NTBMs may not be immediately visible to or fully contained within the remit of the regulator for electricity and gas supply in the UK. Environment scanning processes and/or transparent processes developed to work with any entrants proposing new business models could be implemented to assist with tackling this difficulty.

3) Facilitate the development of NTBMs across sector boundaries by providing opportunities for the use of "open book" contracts, wherein no fixed price (or timeframe) is set at the beginning of the contract, and all costs and decisions are

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of regulations and government policy" (Van der Loo and Loorbach 2012: 240) (In Van der Loo, Loorbach, D. (2012), 'The Dutch Energy Transition Project (2000-2009), in: Verbong G and Loorbach D. *Governing the Energy Transition. Reality, Illusion or Necessity?,* New York, London: Routledge.)

[3] This might include the relaxation of certain regulatory rules temporarily in order to provide space for alternative NTBM to emerge and develop as existing regulatory frameworks may hinder innovation as they are designed with traditional business models in mind. This has been suggested in the literature on strategic niche management as a useful way to foster innovation (e.g. see Hoogma R, Kemp R, Schot J, et al. (2002) *Experimenting for Sustainable Transport. The Approach of Strategic Niche Management,* London and New York: Routledge).

made transparent to all parties throughout the life of the contract. NTBMs can also be facilitated by more integrative thinking in line with international infrastructure trends such as: shift towards closer alignment between capital and operational programmes; thinking in terms of delivering programmes of interconnected projects rather than a suite of independent ones; and greater focus on end-users.

Opportunities for more integrative thinking in electricity and gas delivery can be developed also through coordinated regulatory effort, using existing governance structures like the UK Regulators Network (UKRN). UKRN was formed in March 2014 and includes economic regulators from all infrastructure sectors. It aims to facilitate collaborative work, maximise coherence and shared approaches in the interests of consumers and the economy. If the current structure of regulators is to be retained, embedding a focus on the development of NTBMs into UKRN's work - through specific projects and dedicated objectives and a work stream - can facilitate more integrative thinking at national level by the removal of barriers to business model innovation. Engaging more effectively with NTBMs will also involve creating stronger links between the work of Infrastructure UK at HM Treasury, for example through discussing NTBMs in the National Infrastructure Plan. Similarly, there is a role for Innovate-UK to support NTBMs through the provision of demonstration projects that clarify cost structures and effective forms of operation for such firms.

4) Incorporate learning from the experience of other infrastructure sectors. In the railway sector, one challenging arena following privatisation was that of safety cases and product approvals. These are key gateways for system change. Technical consultant organisations came to provide important expertise to assist in safety case development and approval; in theory this meant that these capabilities were available to all organisations: small and large, new and established. The infrastructure owner's product acceptance process was introduced at privatisation and has subsequently been adjusted by Network Rail. It is needed to allow the implementation of innovative ideas into the system whilst assessing value for money and safety considerations. The structure of the process is defined independently of innovation, supplier or

subsystem and it should be visible and available to existing suppliers and industry entrants alike. A transparent and consistent process for assessing and, potentially, making adjustments for NTBMs is one way to both study and assist their entry into the market. There are interesting parallels between the changes that are ongoing in the energy/electricity market today and changes that were underway in the telecommunications market in the last 20 years, with NTBMs emerging to offer new services and forms of service provision that generated significant architectural shifts in the industry, and disrupted traditional, vertically integrated monopoly suppliers.

5) Develop a registry of projects to learn from. The intersection between the provision of electricity, heat and transport is becoming increasingly blurred and a range of successful BMs with a primary focus on heat are also having an impact on electricity demand and management. Standardised Measurement and Verification procedures (e.g. the International Performance Measurement and Verification Protocol) are increasingly applied for energy performance, and these could form the basis for regulation in the heat sector. Although not necessarily the remit of Ofgem, a registry of projects that have applied a standardised M&V procedure similar to the FIT registry would provide Ofgem with a greater insight into market activity and technological trends that co-evolve with NTBMs to deliver new approaches to distributed generation, demand management and reduction.

6) Support community energy projects[4] and learn from them. Government, local authorities and other stakeholders need to develop their own capabilities to better understand the character of community energy and how best to support the sector. Key features and issues include the following:

a) Community energy is not necessarily a lever for government to pull – community energy projects might not share the same aims as policy makers and regulatory bodies. The community energy sector is not a single thing to be instrumentally governed.

[4] Members of the Sussex Energy Group were part of the Community Innovation for Sustainable Energy (CISE) research project undertaken between 2010-2013. The team conducted 12 in-depth case studies of community energy projects and a survey of 190 community energy groups in the UK.

b) Actors need to be sensitive to the fact that community energy projects may be addressing multiple policy agendas, such as energy saving, tackling social exclusion, improving local economies and developing community leadership. This means that there may be multiple ways of valuing community energy projects.

c) Support measures and tools need to be tailored to different community energy project types and phases, due to the diversity of the sector with different groups and types of activities involved.

d) The diversity of the sector is also reflected in the fact that there is no clear evidence on how many groups are active in community energy. The Community Energy Strategy estimates that there are around 5,000 groups in the UK engaging in community energy. However, this is on the basis of a very broad definition of community energy, which includes projects where there is some community benefit, but need not be much meaningful community involvement in the process of designing and running the project. Databuild, who estimated community energy groups on the basis of a number of surveys, acknowledged that precise data is hard to come by. For example figures on community energy on Ofgem's feed-in-tariff (FIT) registry are inaccurate as only community groups or schools applying for one of the specific FIT benefits they are entitled to, need to identify themselves as a community group or school. As a result, the available information paints an incomplete picture of community engagement with FITs and energy more generally. Hence, more precise data collection is required to analyse the uptake of community energy and school projects as well as other NTBMs in order to respond to their needs. Moreover, the types of data collected need to be chosen in consultation with community energy groups. It can be very hard to gather data on the social benefits most valued by groups.

e) The government could consider relevant policy and regulatory measures from a community energy point of view: e.g., what would plans for electricity market reform mean for community energy groups or people thinking of starting a community energy project.

f) Whilst policy makers and other actors might want a coherent message and easy point of contact for the community energy sector, this can run counter to the diversity of community energy groups, voices and situations.

g) Sudden policy and regulatory changes can have dramatic effects on the viability of different community energy projects, as demonstrated for example

by the changes in the FIT, so there is a need for a long-term perspective and for this to be communicated to groups well in advance of changes coming into force. Community energy projects are far more vulnerable to policy and regulatory changes than more mainstream energy actors, and yet community energy groups are often furthest away from the lobbying and consultative groups that shape decisions in Whitehall.

h) Many projects are unique and cannot be easily standardised. For example, projects often have committed community leaders who work with a dedicated team, putting in a considerable voluntary effort. But there are transferrable elements and learning from previous projects that could ease diffusion (e.g. organisational forms, funding structures and toolkits on a variety of issues such as how to engage with funders, apply for planning or mobilise members).

i) Diffusion of community energy is likely to require continuing policy and regulatory support (just as other forms of energy receive public support of various forms, including fossil energy incumbents).

Questions:

CHAPTER: Two

We would like to hear your views on the drivers for market entry.

The four drivers described in the discussion paper are important and capture the main reasons for market entry. However, the drivers for NTBMs identified could also be described as drivers for change (not just in business models) in the market. The consultation document does not identify a propensity for business model change over other kinds of innovation. Questions to consider are: what might drive business model change over or in conjunction with other kinds of change? And, in terms of the regulator's responsibilities or powers, what distinguishes the response needed for business model innovation over other types of innovation in the market?

Furthermore, the description of driver one (low carbon energy transition) is currently too focussed on energy supply options instead of also foregrounding energy demand and energy efficiency which make a critical contribution to the low carbon transition. In particular it lists a variety of large scale, low carbon technology options (including offshore wind, CCS and nuclear) where there is limited scope for developing new business models. On the other hand, in the area of energy efficiency, energy demand reduction or flexible demand, there seems much scope for new business models (including energy service companies, demand aggregators, storage operation, and so on).

The same is true for driver four (affordability) which again focuses on supply solutions rather than emphasising the importance of reducing or managing demand as a way of increasing affordability. Hence, despite the innovative focus upon NTBMs, much of the document remains within Ofgem's traditional responsibilities and 'comfort zone'.

The utility business model is increasingly under threat with Europe's 20 biggest

utilities losing around half a trillion euros in their share value since 2005[5].

This is partly linked to the failure to adjust business models to the rapid diffusion of result of several renewable energy technologies. The RO and the FITs are the main drivers for the emergence of electricity supply focused NTBMs in the UK. The RO is encouraging a range of investors and foreign shareholder owned utilities to invest directly in UK electricity generation but their business models may be classified as traditional.

There is evidence that some emerging utilities, such as Good Energy and Ecotricity are developing NTBMs by supporting decentralised FIT-eligible installations with better service than the Big Six[6]. Good Energy was the UK's largest FIT administrator in 2013 and the company prides itself with supporting FIT-eligible renewables[7]. Cornwall Energy estimates that that just under 30% of FIT generation is sold to non-Big Six suppliers. Given their market share of less than 7.5%[8], this is evidence of subsidies such as the FIT driving NTBMs.

There are also several drivers for community energy groups to engage in this area that are not mentioned in the consultation. These groups can have several motivations for starting their projects, ranging from saving money on energy bills to saving buildings which are important to the cohesion of local communities. Our Community Energy for Sustainable Energy project (CISE)[9] received 354 responses to a survey which uncovered a wider range of motivations and goals. From a list of

[5] The Economist, 2013, How to lose half a trillion euros, < http://www.economist.com/news/briefing/21587782-europes-electricity-providers-face-existential-threat-how-lose-half-trillion-euros >.
[6] Debenham, C., 2012, Specialist energy companies give best feed-in tariff service; E.On gives worst, YouGen, < http://www.yougen.co.uk/blog-entry/1981/Specialist+energy+companies+give+best+feed-in+tariff+service%273B+E-lon+gives+worst/ >.
[7] Good Energy, 2013, Smaller suppliers come out top for Feed-in Tariff Service, < http://www.goodenergy.co.uk/blog/articles/2013/03/15/smaller-suppliers-come-out-top-for-feed-in-tariff-service >.
[8] Cornwall Energy, 2014, Independent suppliers reach record 7.5% share of domestic market, < http://www.cornwallenergy.com/News/Press-releases/Independent-suppliers-reach-record-7-5percent-share-of-domestic-market >.
[9] Community Innovation for Sustainable Energy (CISE) 2012. Grassroots Innovations. Researching Sustainability from the bottom up. http://grassrootsinnovations.org/2012/03/26/community-innovation-for-sustainable-energy-cise/

possible options, respondents identified an average of 8 objectives per project. These objectives were grouped into broad categories of economic (96%), environmental (88%), social (73%), political (73%) and infrastructural (68%). The most commonly cited objective was saving money on energy bills. Other objectives cited by more than half of the respondents were: reducing carbon dioxide emissions, improving local energy independence, community empowerment, generating income for the community. Substantial minorities also aimed to improve their local environment, tackle fuel poverty, influence wider sustainability and climate change policies, improve community health and wellbeing, etc. Therefore it is important to note that there are several different motivations for community energy groups, which are likely to vary according to the context of each group, including their, capabilities, geographical location and resource base. Not all of these aims (addressing negative externalities) are currently valued in the energy market and it would be important to consider which regulatory incentives and policy instruments can potentially be used to maximise these drivers to stimulate market entry of NTBMs.

Do you think there are other important drivers?

Enabling multiple markets for energy. An important driver for opening NTBMs is to recognise that there are, and need to be, multiple markets for energy and energy services, rather than THE energy market. Could there be a market in local energy for example, ring-fenced from competition with utility markets? There are already multiple electricity markets, with contracts for large industrial energy users looking very different to green markets for households, for example. So thinking about NTBMs also requires consideration of plural energy markets. A lot of community energy projects develop through voluntary activity, and any energy sold into current markets fails to reward this free labour. As with other areas of sustainable innovation, it might be possible to develop community energy markets that better reflect investments involved (above and beyond financial capital, and which include people's social capital and good will). Such markets could be supported through, for example, public procurement arrangements, as has been done for sustainable food in some cases. Any regulation for NTBMs in energy needs to think carefully about the design and regulation of markets dedicated to NTBMs. It is unrealistic to expect

NTBMs to compete against incumbent utilities: their aims, logics, rationales, drivers, and so on are completely different. They are not playing to the same rules.

1)The experiences of other infrastructure sectors suggest that information technology innovations, particularly in relation to improvements in the ability to control infrastructure systems have been important in driving changes in business models. Improved control has opened up new opportunities for managing demand and hence for offering new customised services.[10] This driver of innovation is likely to be particularly important in IT intensive areas of the various energy sectors, such as those related to financial markets.

2) Austerity measures, budgetary cuts and restrictions. Another important driver of relevance to NTBMs is austerity measures and budgetary cuts at multiple scales, including national agencies, local authorities, companies, voluntary organisations and households. Innovative bottom-up economic and social activities at community and local levels - sometimes taking place outside the formal economy and involving a range of non-market transactions - have emerged.[11] The notion of 'informal economy' has been used to describe a wide range of activities, which may include, but are not limited to, sharing, barter, volunteering, unpaid domestic work, etc.) (for more details see Gibson-Graham 2008[12]). Informal economies tend to be organised in innovative and inclusive 'governance structures' often referred to as 'social innovations', which work on two levels: addressing issues in social relations (process changes) and addressing social needs (outcomes changes).[13]

[10] Nightingale et al 2003, Capacity utilization revisited: software, control and the growth of large technical systems, Industrial and Corporate Change, 12 (3): 477-517; Davies, A (1996) Innovation in Large Technical Systems: The Case of Telecommunications Industrial and Corporate Change, 5 (4): 1143-1180

[11] Polese, A., Morris, J., Kovács, B., Harboe, I., 2014, "Welfare States" and Social Policies in Eastern Europe and the Former USSR: Where Informality Fits In? Journal of Contemporary European Studies 22, 184–198.

[12] Gibson-Graham, J.K., 2008, Diverse economies: performative practices for 'other worlds', Progress in Human Geography 32, 613–632.

[13] McNeill, J., How do public policy and programs enable social innovation activities that contribute to more sustainable forms of local and regional development? 2013, Paper presented at the 4th EMES International Research Conference on Social Enterprise - Liege, 2013.

Social innovations have emerged in many places, often to bridge a gap in product and/or service delivery that has been limited or removed as a result of budgetary cuts. By design they tend to be open to knowledge-sharing, and they can enhance the capacity to act and empower citizens and users. Their existence is often facilitated by access to data, using digital platforms for organising.

Budgetary cuts have also impacted the work and governance structures of municipalities and local authorities. In some cases, these cuts have forced integrative thinking across previously separated services and sectors because they have been bundled together as a result of internal restructuring to cope with diminished staff levels. In some cases, such Leeds, Manchester and Newcastle, these processes have gone beyond bundling with the aim of enhancing resilience and coping with interdependencies.

3) International dynamics of infrastructure delivery. These include integrating capital investment decisions (building assets) and the experiences of end users; and more stringent national requirements for service quality (e.g. security).

These dynamics provide windows of opportunity for changing the scale and time frame of operations of companies; to involve a larger set of actors, some of whom might be new entrants to the sectors (e.g. open data management companies) and more collaborations; to gain access to new financial instruments (e.g. public-private partnerships, public-public partnerships); and to increase acceptance of electricity and gas delivery mechanisms and infrastructure with consumer and citizens in close proximity to potential negative externalities.

4) Changes in user expectations and behaviours. The changing dynamics of infrastructure delivery at international level are also connected to another, increasingly important driver: changes in user expectations and behaviours. Technology advancements in ICT have provided more direct platforms for engagement with users and citizens. Increased connectivity has required more

investment in access to information and need for responsiveness and engagement with users and society in general.

5) Shift towards combining products with services. The diffusion of energy efficiency technologies is even more dependent on NTBMs. ESCOs are particularly important in energy efficiency technology diffusion and the energy service contracts range from product-service contracts for individual technologies to infrastructural Design, Build, Finance, Operate (DBFOs) contracts. They are often collectively labelled as Energy Performance Contracts (EPCs/EnPCs, Energy Saving Performance Contracting) or ESCO solutions. The emergence of performance-based NTBMs are associated with the shift from selling products to combining products with services. This changes the relationship between the manufacturer, who is increasingly both product and service provider, and the customer, who has decreasing responsibilities for operation and maintenance of products.

Lighting is an example of a technology where manufacturers are increasingly offering so-called use-oriented solutions and 'pay-as-you-save' contracts[14].

6) Longer term contracts. Manufacturers of primary conversion equipment (capital goods) are increasingly offering EPCs that have evolved out of DBFO and DBOOT (Design Build Own Operate and Transfer) contracts[15]. Longer term contracts provide an incentive for the manufacturer not only to design and build or refurbish assets such as CHP engines but also to maintain, operate and/or retain ownership of the equipment or the entire energy centre on a specific site and guarantee savings as part of an NTBM. EPCs involving infrastructure replacement, CHP and district heating on NHS Trust sites can provide 50-80% of on-site power demand[16] and additional boilers and generators on standby may boost this figure to 100%.

[14] Philips, 2014, Case study - National Union of Students, < http://www.lighting.philips.co.uk/projects/nus.wpd >.
[15] Steinberger, J., van Niel, J. and Bourg, D., 2009, Profiting from negawatts: Reducing absolute consumption and emissions through a performance-based economy, Energy Policy 37, 361-370.
[16] CEF, undated, Cambridge University Hospitals, Carbon and Energy Fund, < http://carbonandenergyfund.net/public_docs/NHS%20Energy%20Efficiency%20Forum%20-Addenbrookes%20-%20Richard%20Howe.pdf >.

7) Outsourcing. Outsourcing non-core services such as IT, catering and logistics is increasingly common across the private and public sector, which is reflected by the success of specialised outsourcing companies [17]. Contractual and financial innovations are enabling these outsourcing companies to develop NTBMs that target energy alongside other services.

8) Clarification of cost structures and potential opportunities for profits as the various subsectors mature are encouraging market entry by 'fast followers', often involving managers and staff from 'first mover' firms.

[17] Elmualim, A., Shockley, D., Valle, R., Ludlow, G., Shah, S., 2010, Barriers and commitment of facilities management profession to the sustainability agenda, Building and Environment 45, 58-64.

Questions:

CHAPTER: Three

Have we accurately described the NTBM environment?

The description of the NTBM environment in the context of demand reduction needs to be unpacked in more detail - which we do briefly here.

Energy service companies (ESCOs) cover a wide range of organisations and financial arrangements. Energy service contracts allow the client to reduce operating costs, transfer risk and concentrate attention on core activities. However, the energy services model may only be appropriate for a subset of energy services and energy using organisations.[18]. ESCOs have a variety of origins, however, including:

- Suppliers of primary conversion equipment (e.g. Dalkia)
- Suppliers of control and buildings equipment (e.g. Johnson Controls)
- Suppliers of secondary conversion equipment (e.g. Philips Lighting)
- Subsidiaries of construction companies (e.g. Willmott Dixon Energy Services)
- Subsidiaries of utilities (e.g. E.On)
- Outsourcing specialists (e.g. MITIE)
- Procurement agencies (e.g. Utilitywise)
- Independent energy service providers (e.g. ANESCO)
- Local authority energy service providers (e.g. Aberdeen Heat and Power Company Ltd)
- Community energy service companies (e.g. Brighton and Hove Energy Services)

Utilities are engaging in energy service contracting to retain market segments and sustain investment capacity in light of their traditional business models coming under pressure.[19], Although interpreted by some as a fundamental shift in utility business models, the developments to date in this area have been rather limited and utilities

[18] Sorrell, S., 2005, The contribution of energy service contracting to a low carbon economy, Tyndall Centre Technical Report No. 37, SPRU, Brighton: ii.
[19] Chazan, G., 2014, Crisis-hit European utilities square up to technological revolution, Financial Times.

are not the dominant players in the ESCO market[20]. Even large utilities only have small teams working on energy service contracting, with total staff numbers forming less than 1% of the utility workforce. Professionals with in-depth experience of successfully implementing energy service contracts may number no more than 20 in the UK.

Our general definition of an energy service contract is:

- *the transfer of operating risks and decision rights over key items of energy equipment under the terms and conditions of a long-term contract, including incentives to maintain and improve equipment performance over time.*

A basic distinction is between an *energy supply contract*, which focuses upon the provision of 'useful energy' such as electricity, steam, hot water and coolant, and an *energy performance contract (EPC),* which focuses to a greater extent on the provision of final 'energy services' such as heating, lighting and motive power.[21] Both exist in the UK, with the former having lower transaction costs and being more widespread, and the latter having higher transaction cost but offering the potential of greater energy savings.

The precise contractual forms vary widely, but are commonly classified as follows:[22]

- **Guaranteed savings contracts**: The most common EPC structure in the UK. The ESCO guarantees a minimum level of savings in either costs or kWh or pays the difference. Greater savings than the guaranteed amount may be split. All the ESCO's costs are paid up front by the customer or on an ongoing basis through energy savings. Contract lengths are typically 4-8 years;
- **Shared savings contracts**: Savings are not guaranteed but shared during the contract period to an agreed formula. The actual cost of the measures is

[20] Hannon, M.J., Foxon, T. J., Gale, W. F., 2013. The co-evolutionary relationship between Energy Service Companies and the UK energy system: Implications for a low-carbon transition. Energy Policy 61, 1031-1045.
[21] Sorrell, S., 2005, The contribution of energy service contracting to a low carbon economy, Tyndall Centre Technical Report No. 37, SPRU, Brighton.
[22] DECC, 2014, UK National Energy Efficiency Action Plan, Department of Energy and Climate Change, London.

not included in the contract. Contract terms are up to 10 years as it takes longer for the investment to be recovered, and the risks to the ESCO are higher;

- **Product Service-Systems/Pay per use contracts**: The payment schedule is based on the level of savings or on use. The ESCO maintains ownership of measures and takes them back once the contract has terminated. Contracts usually focus on single technology systems, such as lighting;
- **First-out contracts**: The ESCO pays for and installs measures and takes all the savings until costs have been recovered and the contract is terminated, passing all savings on to the customer.

Our survey in 2014 revealed that the most commonly installed technologies under energy service contracts included boilers, CHP, HVAC, renewables and lighting, followed by Building Energy Management systems, pumps and motors and drivers. Less common were building envelope improvements, industrial processes, heat recovery and water and/or ICT. Appliances were rarely targeted. Slightly more contracts were in place in the commercial sector than in the public sector, few companies engaged with industry, no more than 20% of the contracts of any company were in the housing sector and the commercial sector contracts were slightly more valuable than public sector contracts.

In 2004 the bulk of EPC activity was in the commercial sector,[23] but the balance is now shifting towards the public sector. Public sector buildings provide a good market for EPCs, owing to factors such as the generic nature of the relevant technologies, the multiple obstacles to in-house energy management, the limited finance for energy efficiency investment and the increasing reliance upon outsourcing.

An important initiative in the UK public sector has been the development of *procurement frameworks* for energy service contracts.

[23] Sorrell, S., 2005, The contribution of energy service contracting to a low carbon economy, Tyndall Centre Technical Report No. 37, SPRU, Brighton.

These involve standardised contracts that comply with EU procurement regulations and can be used with pre-qualified energy service companies (ESCOs) for implementing energy efficiency projects. The most important examples include those that have been specifically developed for local authorities, such as RE:FIT within the Greater London Authority; and those that have been developed for the National Health Service but which are being extended to other parts of the UK public sector, such as the Carbon and Energy Fund. These frameworks streamline the procurement of EPCs by providing pre-negotiated contracts that comply with relevant regulations. As a result, they can significantly reduce the transaction costs of negotiating and establishing contracts and monitoring contract performance.

Local authorities are also increasingly active as an energy service provider themselves, primarily for heat provision. Licence Lite may encourage local authority ESCOs to diversify their offer and enable the development of multi-service providers or municipal energy companies. Around 30% of the UK's 434 local authorities are actively planning, and investing in, energy provision, although only 9% are showing evidence of 'significant' energy project investments[24]. Local authorities have significant influence over energy use in residential, public and commercial buildings as well as energy generation from waste, renewable and low-carbon sources. Despite the presence of carbon and energy management plans, the constrained finances of local authorities can limit their capacities to implement those plans. Local authorities use multiple models of energy leadership, including acting as enabler for other public, private and community actors to invest in localised energy, direct energy provision for housing and/or public estate, provision through joint ventures with private utilities, or using planning powers to deliver low carbon business zones or infrastructure for renewable industrial development.

[24] Hawkey, D., Tingey, M., Webb, J., 2014, Local Engagement in UK Energy Systems – a Pilot Study of Current Activities and Future Impact, Energy Technologies Institute and University of Edinburgh, Edinburgh.

Have we missed something?

Yes. NTBMs are often seeking to operate according to values that are poorly recognised in energy markets, such as social inclusion, or environmental performance. NTBMs' definition talks about transforming energy systems, however how energy markets need to be transformed in order to accommodate NTBMs has not been considered explicitly and systematically.

We'd like to learn more about organisations using NTBMs. If you are prepared to discuss this, please contact us (see Appendix 1 for contact details).

Questions:

CHAPTER: Four

Our main focus in this paper is on regulatory issues arising from future energy market transformation, but we recognise that there are relevant issues within current regulation. Please let us know if there are any other issues?

Current energy market arrangements and regulations negatively affect the emergence and viability of NTBMs in a variety of ways. If NTBMs are to play a key role in transforming the UK energy system, policy and regulation has to be actively shaping markets rather than simply trying to fix market or system failures (Mazzucato 2013[25]) or getting 'out of the way' as the Ofgem discussion paper suggests.

The main driver for market entry is expectations about future profits (Mazzucato 2013) therefore the strategic direction of policy and regulation has clear a guiding functions. The perceived focus of UK energy policy and regulation on energy supply (based on interview evidence with stakeholders) may therefore undermine potential interest and investments in energy demand reducing innovations and associated business models. This bias is reinforced by the discussion document which foregrounds supply rather than demand - such perceptions can matter a great deal for the emergence and viability of many types of NTBM.

Traditional approaches to correcting market failures may not be sufficient to reduce the dominance of incumbents in the energy market - and this in turn may limit innovation. Recent evidence from the capacity market auctions is arguably a case in point, with the majority of contracts going to incumbents operating gas, nuclear or coal-fired power stations (see Hatchwell, 2015)[26]. Therefore, if DECC and Ofgem are serious about promoting NTBMs as a means to achieve energy system change, future policy and regulatory developments may need to consider the use of tools which stimulate new players instead of cementing the position of incumbents.

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[25] Mazzucato, M (2013) *The Entrepreneurial State.Debunking Public vs. Private Sector Myths*. Anthem Press.

[26] ENDS Report 480, February 2015, pp. 24-26, 27 January 2015

As one way of doing so Van den Bergh et al (2007)[27] have suggested the notion of the 'extended level playing field'. This combines five elements: 1) internalising external environmental costs; 2) supporting sustainable innovations that are at an early stage of the learning curve to avoid early lock-out; 3) equalizing the time horizon of investors or firms; 4) correcting for increasing returns to scale in order to avoid undesirable early lock-in; and 5) exposing different technological options to similar selection mechanisms. In general, support for alternatives need to be combined with measures to put pressure on incumbents.[28].

Some types of NTBMs, such as community energy groups, face significant challenges in progressing initial ideas to delivery. Groups have to engage with complex legal processes and build up organisational structures from scratch, with limited experience and few relevant precedents. These initiatives are often developed outside mainstream practices and encounter legal, accountancy, planning and financing hurdles. For example, identifying an appropriate legal structure is not an easy process and necessitates hours of (voluntary) discussion and research, as there are numerous grey areas that need to be considered. Similarly, it is hard to define what constitutes a community benefit – is it enough for an organisation to have community benefits included in their model rules, or should they provide quantifiable evidence that they are benefiting their community? But what would be the measure: saved carbon, displaced energy load, jobs? And who is the community precisely, and what constitutes a benefit (and risk)?

On the other hand, organisations such as Carbon Leapfrog have helped community energy projects navigate through regulations by acting as **intermediaries** and playing a brokering role. They can connect groups with professionals who have the legal, marketing and accounting knowledge needed to develop their project

[27] van den Bergh JCJM, Faber A, Idenburg A, et al. (2007) *Evolutionary Economics and Environmental Policy. Survival of the Greenest,* Cheltenham, Northampton: Edward Elgar.

[28] Paula Kivimaa & Florian Kern, 2015. "Creative Destruction or Mere Niche Creation? Innovation Policy Mixes for Sustainability Transitions," SPRU Working Paper Series 2015-02, SPRU - Science Policy Research Unit, University of Sussex.

[Hargreaves et al, 2013][29]. It can be valuable, therefore, to support these intermediaries because they help initiatives navigate through the necessary regulatory requirements.

Analysis commissioned by DECC prior to the Community Energy Strategy, and drawing upon community energy databases, found community energy projects to be distributed fairly evenly across the least to the most deprived areas of England[30]. The urban-rural split was also quite even. Encouraging as this is, it is unclear what the specific community processes and outcomes are for the 2,627 projects that could be post-coded in this way. The continued use of a broad and flexible definition in the Strategy leaves open questions about the community development involved. Our research found policy towards community energy makes a number of assumptions about the baseline interests and capacities that groups need in order to engage with the support offered. Eligibility includes presumptions about neighbours, say, meeting criteria as a legally constituted group, or being able to articulate aims according to the criteria and standards expected of good application writing, or being able to convene more powerful partners into a project and meet their expectations.

Community energy projects in the UK tend to be led by committed people with high levels of formal education. Reaching out to people from a wider variety of class, ethnicity, and other demographic and socio-economic backgrounds, where requisite capabilities are oriented to priorities other than sustainable energy, poses a challenge that goes right to the heart of economic and social issues in society. Even small things, such as utility partners calling meetings during office hours, or holding them in London, far from many communities (as is often the case), suggest a failure to appreciate community realities and some insensitivity to the voluntarism and free labour involved.

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[29] Hargreaves, T; Hielscher, S; Seyfang, G; Smith, A; (2013) Grassroots innovations in community energy: The role of intermediaries in niche development. *Global Environmental Change,* Vol 23, 5, Pages 868–880 http://www.sciencedirect.com/science/article/pii/S0959378013000381

[30] Scotland and Wales were not analysed.

The development of a regulatory and market framework needs to reflect upon debate about the meanings, limitations and expansion of community involvement in energy transitions, currently and in future. Community development insight could inform the forms of participation required, and whether they become even more difficult under policy engaging communities too instrumentally in the scaling-up of model energy partnerships. It is striking how lightly the DECC Strategy touches on questions of community development and social purpose. Whilst diffuse social benefits from community energy projects are acknowledged in the Strategy, they are dismissed as difficult to quantify and attribute systematically and comparably, and so are not afforded the same consideration as financial, energy and emissions monitoring.

Questions:

CHAPTER: Five

What are the benefits of different NTBMs to energy consumers?

While there may be benefits of (some) NTBMs to individual energy consumers (e.g. a firm making savings through energy service contracts), we see the more important role of NTBMs collectively to contribute to a strengthened dynamic of energy system change (see points below). In particular, support for NTBMs might be a key way by which the potential for energy demand reduction is realised and integrated into the existing supplier-dominated energy market.

ESCOs offer the opportunity to overcome many of the obstacles to cost-effective energy efficiency investments - thereby providing benefits to clients in terms of lower and more predictable energy bills, improved equipment performance, high productivity and better environmental performance. The installation of energy efficiency measures and/or on-site energy supply technologies also has the potential to reduce network costs if demand is reduced and/or the electricity is used on-site.

Community energy projects potentially offer a wide range of social and economic benefits. For example our research [31] suggested the following objectives of community energy developers: Saving money on energy bills 96%, Generating income for community 83%, Tackling fuel poverty 47%, Improving local economy 36%, Skills development 31%, Local job creation 27%; Community wellbeing and health 43%, Improving education 40%, Social cohesion 30%, Social inclusion 37%, Creating volunteering opportunities 29%. It is also worth noting that some NTBMs do not treat users of the initiative as consumers, but rather as members of a co-operative, or energy citizens.

[31] Community Innovation for Sustainable Energy (CISE) 2012. Working paper: Community Energy in the UK. http://grassrootsinnovations.org/2012/10/09/working-paper-community-energy-in-the-uk/

Are these benefits experienced by all energy consumers or only those directly receiving the NTBM's services?

There may be direct benefits to individual energy consumers, but the value of NTBMs needs to be seen from an overall energy system perspective. For example many benefits of energy demand reduction/demand savings are at the system level.

Community energy projects may have the capacity to reach a wider audience than the initial community energy group as projects can have a far-reaching influence on local communities through avenues such as social marketing, neighbourhood events, awareness raising and other actions. Low carbon community projects [32] with electricity savings exceeding the national average tend to be focused on community renewable electricity supply from FIT-eligible technologies (e.g. using solar PV), despite an electricity consumption baseline below national average as a starting point. This points towards the possibility of community energy projects changing electricity behaviour if they are accompanied by energy feedback as well as group learning. Nevertheless, further research is required to establish the value of those benefits and how they may be measured.

Other benefits are more diffuse but can have a wider benefit, such as the social and community development benefits mentioned earlier. Community energy projects indicate that it is possible to think about and develop energy services in different ways to the systems that have dominated for decades. Given the profound implications of ambitious carbon targets, the opening of debate in this very practical way is an invaluable public good. [33]

[32] Gupta, R., 2015, Insights from EVALOC project – Evaluating low carbon communities, Oxford Institute for Sustainable Development, Oxford Brookes University, Oxford.
[33] Seyfang, G., Hielscher, S; Hargreaves, T; Martiskainen, M; Smith, A; (2014) A grassroots sustainable energy niche? Reflections on community energy in the UK. *Environmental Innovation and Societal Transitions*, Vol 13, Pages 21–44

Are there additional wider benefits to the energy system and beyond it?

The most important wider benefits of NTBMs to the energy system and society at large are their potential contribution to the transition to a low carbon economy. System change and radical innovation are rarely produced by regime incumbents, which is why it is crucially important for the government and the regulator to incentivise new entrants and NTBMs in the energy market. This may well have benefits in the short term (in terms of stimulating competition and driving down consumer prices) but particularly in the long-term in terms of contributing to a systemic change of the UK energy system.

Energy efficiency and demand reduction can have a range of societal benefits (positive externalities) that are only partially captured by the organisations involved. These include for example, improved health and well-being, increased productivity and improved energy security. Recent IEA work on the 'Multiple Benefits of Energy Efficiency'[34] provides a good basis for appraising opportunities and quantifying benefits in this area.

Which of these benefits should be taken account of in regulatory policy-making and decision-taking and why?

Since it is Ofgem's statutory duty to protect both current and future consumers as well as to promote sustainability, it is important that such wider system benefits (even if accruing in the medium to longer term) are taken into consideration. It is important to evaluate these benefits first, in order to establish their social value and potential impacts. For instance community energy projects may improve economic, social and environmental capital, all of which can reap different benefits. Although, it is not possible to internalise all these values into market transactions, their social benefit can be recognised, justified and supported through regulatory measures.

Are there energy system costs or risks from any of the NTBMs?

[34] http://www.iea.org/W/bookshop/475-Capturing_the_Multiple_Benefits_of_Energy_Efficiency

It is difficult to answer this question in the abstract as the costs or risks will vary depending on the type of NTBMs as well as their diffusion within the energy market.

How might these be addressed?

How will NTBMs help to drive innovation within the energy system?

NTBMs will change the points of entry and the 'selection environment'[35] (Nelson & Winter, 1977) for innovations of all kinds. New organisational structures, definitions of value and points of value capture adjust the actors and the relevant parameters that influence the introduction of innovations. For example, innovation may be encouraged through the diffusion of energy efficiency and energy generating technologies. Renewables are usually installed to benefit from the Feed-in Tariff. Area-based approaches (such as those sought by local authorities) can allow for more innovative solutions through project bundling and economies of scale.

The case of Community Energy initiatives deviates from this framing of the question, as they differ from market-based innovations in several key ways (detailed in the response to chapter one). Their niche protection consists of being a space for alternative (often green and sustainability-oriented) values to be expressed, as opposed to shielding from market forces[36]. These initiatives can generate a range of innovations, including: novel uses of technologies; novel processes and methodologies for involving people in choices about energy system options; cultivating new identities as active energy citizens; advancing concepts helpful to the transition to sustainability, such as community involvement, decentralization and social justice; insights into the difficulties of opening up incumbent energy systems to public participation; and new policy approaches, such as prizes and partnering. Much of this innovation is underappreciated and undervalued by conventional energy

[35] Nelson, R. R. & Winter, S. G. 1977, In search of a useful theory of innovation, Research Policy, 6(1): 36-76.

[36] Seyfang, G.(2009) The New Economics Of Sustainable Consumption: Seeds Of Change, Palgrave MacMillan ISBN, UEA Repository

innovation institutions.

Previous research with such initiatives has found that for participants, it is often the symbolic and shared practice of values which brings the principal benefits, rather than any tangible economic or material impacts. For example, local currency activists feel empowered by creating and using money which values people's labour equally; food activists value their ability to bypass supermarkets, even for relatively small proportions of their provisioning.

How could NTBMs potentially transform the energy market and what fundamental challenges to regulatory arrangements could this entail?

The ESCO market could be dominated by subsidiaries of utilities and specialised outsourcing companies such as Facilities Management Companies. Given the interest by local authorities in diversifying local authority ESCO models from heat generation and supply to electricity generation and supply there may be scope for these BMs to shift their focus to energy demand management and challenge the dominance of large and well established ESCOs.

It is important for community energy actors to prove their contribution to sustainable energy and reducing carbon emissions in order to maintain and raise the level of interest and support from the business and the public sectors. The mainstream actors' desire to have a clear picture of community energy impacts is also understandable, if their intention is to support community energy and to gear up the sustainability of the energy system as a whole. However, our research suggests that some of the energy performance data being produced may not provide an accurate picture of community carbon/energy performance. This is partly due to community groups' lack of capacity, but mainly due to the lack of standardised methods, access to baseline data and reliable energy monitoring systems. Consequently, enhanced access to better infrastructure for monitoring and existing energy data can improve carbon/energy impact evaluation. For community groups, training and skill development for carbon calculation, energy performance monitoring and evaluation should help improve the quality of carbon/energy performance data – although it might be better if other agencies implemented the monitoring, rather than under-resourced community groups.

Furthermore, Government and funding bodies should not consider community energy projects only as a tool to build sustainable communities or as an instrument to meet carbon/energy targets. The evaluation of community energy impacts should also use qualitative approaches for social impacts which are often the main objectives of community projects, such as community involvement, social cohesion and inclusion, social leaning and community leadership, etc. In this way, the pressure for measuring carbon/energy impacts which is often costly and time consuming (especially for volunteers) can be eased for community groups. Multiple, mixed methods impacts assessment could also help develop and sustain the capacities of community energy in the long-term. A representative sample of groups, or a cross-section, should be considered as part of any monitoring strategy. A balanced approach needs to be developed to assess the impacts of community energy projects by taking into account intangible process outcomes as well as tangible product outcomes.[37]

Community Energy focused NTBMs have considerable transformational potential, but those practising this approach have relatively little agency or influence to bring about deep changes to energy markets. So in addition to consulting community energy groups and local energy groups about how they can change markets, regulators could consider re-balancing the influence incumbent energy providers have over the design of energy infrastructures and institutions, so that they become more accommodating to NTBMs.

How could regulatory arrangements change to accommodate NTBMs?

The current ESCO market has emerged without much specific regulation to guide it. Public sector procurement of cost-effective energy efficiency measures has only recently received government attention in the form of Procurement Policy Notes[38,39].

[37] Community Innovation for Sustainable Energy (CISE) 2012. Grassroots Innovations. GI BRIEFING 8: MEASURING COMMUNITY ENERGY IMPACTS http://grassrootsinnovations.org/2012/04/13/gi-briefing-8-measuring-community-energy-impacts/

[38] Cabinet Office, 2014, Procuring Policy Note – Implementing Article 6 of the Energy Efficiency Directive, Cabinet Office, London.

[39] CCS, 2015, Procurement Policy Note - Implementing Article 6 of the Energy Efficiency Directive: further information, Crown Commercial Service, London.

If local authorities maintain their interest in developing local solutions that include energy demand management and if the ESCO market succeeds at delivering EPCs outside the public sector, regulation may need to ensure that the utilities, even if they were to shift their business model, operate on a different 'playing field'.

Community energy groups require support that recognises and respects the diversity of aims and approaches as a reality of community energy and supports those forms of intermediation that respond to this (e.g. through face-to-face mutual learning, rather than through attempts to codify and standardise action on the ground). This would also mean support that enables the development of a flexible and locally devolved institutional infrastructure that is not expected to speak with a single, common or coherent voice. Furthermore, community energy requires support that develops and empowers the wider space for grassroots innovations by addressing the distortions and structural inequalities that exist in current policy and market contexts.[40]

What role do NTBMs and other parties have in managing energy market transformation and regulatory change?

It has been argued that ESCOs co-evolve with a changing energy market and that they may proliferate at the expense of utilities[41]. This is not guaranteed as other NTBMs may prove more effective alongside ESCOs and utilities, such as more disruptive renewable energy and storage NTBMs that shift and/or reduce loads of individual buildings to entire sites or communities. An ESCO market dominated by subsidiaries and large market players also does not necessarily represent energy market transformation as energy demand management may only become part of a vertically integrated BM with a core function of supplying energy.

[40] Hargreaves, T; Hielscher, S; Seyfang, G; Smith, A; (2013) Grassroots innovations in community energy: The role of intermediaries in niche development. *Global Environmental Change,* Vol 23, 5, Pages 868–880 http://www.sciencedirect.com/science/article/pii/S0959378013000381

[41] Hannon, M., Foxon, T., Gale, W., 2013, The co-evolutionary relationship between Energy Service Companies and the UK energy system: Implications for a low-carbon transition, Energy Policy, 61: 1031-1045.

In this context, the emergence of local authority ESCOs may point towards a greater transformative power towards greater decentralisation[42], which is already more evident in countries such as Germany and Denmark that are lacking the tradition of centralisation[43].

NTBMs such as community energy are well placed to aid the transition to a more sustainable energy system which takes into consideration not only economic profit, but also social and environmental values. The UK's energy market has been saturated by customer complaints and the lack of trust towards the dominating 'Big Six' energy suppliers. Community energy groups often have the trust and support of their local communities and can reach a wide range of people. They can transform local communities in providing benefits, creating secure suppliers of sustainable energy at the point of demand and most importantly raise awareness of the need for a sustainable energy transition. Community energy can hence empower and provide tools for local communities to directly act on climate change. However, the basis of trust has been built after considerable work, and by thinking and doing energy differently. Were NTBMs simply to act like micro-utilities, or become seen as partners fronting larger utilities, then this trust may be jeopardised. There are examples of community groups being let down by larger partners, such as over Green Deal implementation or house refurbishment projects, and which damages the group's reputation as a result.

[42] Transition Pathways Research Consortium, 2015, Distributing Power – A transition to a civic energy future – Report of the Realising Transition Pathways Research Consortium 'Engine Room'.
[43] Nolden, C., 2013, Governing community energy – Feed-in tariffs and the development of community wind energy schemes in the United Kingdom and Germany, Energy Policy, 63: 543-552.

Contributors and related research:

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Florian's research focuses on policies and policy processes aimed at stimulating the transition to a low carbon economy. His work draws on innovation studies as well as policy analysis and political science. Florian is leading one of the cross-cutting projects of the Centre on Innovation and Energy Demand (CIED) on policy synergies and trade-offs.

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Adrian's research focuses upon the politics and governance of innovation for sustainability and draws upon ideas and methods from political science, innovation studies, and science and technology studies. Adrian's recent work has focused in particular upon grassroots innovations for sustainable development and transitions to sustainability and includes projects on Community Innovation in Sustainable Energy and the Politics of Low Carbon Innovation.

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Colin has an academic background in geography, history, economics, politics, sustainable development and energy policy with research interests spanning environmental sustainability, the diffusion of innovation and energy system transformation. He joined CIED in September 2013 where he is currently working on the diffusion of energy service contracting. This project originally sought to answer the question: 'What explains the scope and nature of energy service contracting in the UK and what is the future potential of this type of business model?' The project now specifically on energy performance contracts (EPCs) since they involve a more radical departure from conventional market arrangements

and have the potential to provide larger energy savings.

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Mari is currently working for the Centre on Innovation and Energy Demand, concentrating on issues such as energy efficiency policy and innovation linked to building energy efficiency. Previously, Mari worked in the energy industry for RenewableUK and www.bunkerworld.com. Mari's research interests and projects have included topics such as energy efficiency policies in buildings, community energy, the role of user behaviour in energy demand and debates surrounding energy technologies such as nuclear power.

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Sabine is a Research Fellow at SPRU interested in the politics and processes of grassroots innovations and the dynamics of everyday (sustainable) consumption patterns. Her work focuses on the emergence and development of grassroots innovations in the context of community energy and 'makerspaces', including the CIED project on 'Grassroots innovation in low energy digital fabrication'.

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Paul's current areas of work relate to business models, infrastructure, financial innovation, and the impact of innovation on society. He is currently working on a large EPSRC project 'Building Better Business Models' jointly held with Prof. Baden Fuller at Cass Business School, and the International Centre for Infrastructure Futures, a large ESPRC funded research centre with its base in UCL. Paul is also deputy director of SPRU and runs a number of large research projects, as well as teaching on SPRU's MSc courses.

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Ralitsa is part of a team in the International Centre for Infrastructure Futures (ICIF) which investigates changes to the business model of infrastructure delivery and operation at national and urban scales. She is working on developing comparative case studies between sectors and countries. Previously, Ralitsa was part of the UK Infrastructure Transitions Research Consortium (ITRC) and worked on governance and regulation related to interdependencies between UK infrastructures for the energy, water, transport, waste and ICT sectors. Ralitsa's research focuses on development of low carbon energy infrastructure, particularly smart grids and low carbon vehicles; connection and transmission of renewable electricity and natural gas; and smart cities. Ralitsa is a member of the Sussex Energy Group.

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Katherine Lovell is a Research Fellow at SPRU and is part of the International Centre for Infrastructure Futures (ICIF). Kat is researching business models in infrastructure delivery and operation, with a particular focus on the railway and energy sectors. She has research expertise in innovation studies and has several years' experience studying the UK railway system.

Dr. Vedran Zerjav, Research Fellow (The Bartlett School of Construction & Project Management, UCL)

Vedran is part of a team in the International Centre for Infrastructure Futures (ICIF) examining the delivery and innovative business models for the provision of public services through infrastructure assets. He is developing in-depth case studies and organising a series of interdisciplinary workshops as a learning space that brings together practitioners from a diverse array of domains, to develop a better understanding of the delivery challenges and business models innovation. His research interests are focused on developing infrastructure for remote and demand-driven healthcare services, and on design management issues in large-scale projects, such as the London Olympics.

About SPRU

With almost 50 years of experience, SPRU is internationally recognised as a leading centre of interdisciplinary research on science, technology and innovation policy. Our research addresses pressing global policy agendas, including the future of industrial policy, inclusive economic growth, the politics of scientific expertise, energy policy, security issues, entrepreneurship, and pathways to a more sustainable future. At SPRU, we are driven by a desire to tackle real-world questions, whilst also contributing to a deeper theoretical understanding of how innovation is shaping today's world. Currently, with 50 research staff, over 70 doctoral students, over £7m of ongoing Research Council projects, as well as the leading journal in its field, Research Policy, SPRU is at the forefront of new ideas, problem-orientated research, inspiring teaching, and creative, high impact engagement with decision makers across government, business and civil society.

About SEG

The Sussex Energy Group at SPRU undertakes academically rigorous, inter-disciplinary research that engages with policy-makers and practitioners. The aim of the research is to identify ways of achieving the transition to sustainable, low carbon energy systems whilst addressing other important policy objectives such as energy security and the long-term challenge of combatting climate change. While we start from the UK energy system, we also work on European issues and the developing world. Issues range from the local (e.g. community energy, city-scale sustainability) to the national (e.g. interaction of different national policy instruments) to the global (e.g. transfer of low carbon technologies to the developing world.)

About CIED

The Centre on Innovation and Energy Demand (CIED) is one of six Research Centres on End Use Energy Demand funded by the RCUK Energy Programme

CIED investigates the drivers and barriers to low energy innovations throughout the economy and the implications of these innovations for energy demand. The research programme aims to develop a socio-technical understanding of the *emergence*, *diffusion* and *impact* of low energy innovations, including new technologies (e.g. heat pumps), organisational arrangements (e.g. car sharing) and modes of behaviour (e.g. cycling) that are expected to improve energy efficiency and/or reduce energy demand.

CIED is a collaboration between researchers from the Sussex Energy Group (SEG) at SPRU, University of Sussex; the Transport Studies Unit (TSU) at the University of Oxford; and the Sustainable Consumption Institute (SCI) at the University of Manchester.

About ICIF

At the International Centre for Infrastructure Futures (ICIF) we are working to create new ways of bringing together stakeholders involved in renewing the UK's infrastructure to exploit structured, multidisciplinary systemic thinking about infrastructure interdependencies when developing new business models. Because infrastructure innovations alter the social distribution of risks and rewards, the public needs to be involved in decision making to ensure business models and forms of regulation are socially robust. As a consequence, ICIF has a major focus on using its research to catalyse a broader national debate about the future of the UK's infrastructure, and how it might contribute towards a more sustainable, economically vibrant, and fair society. Our research is embedded in the international context.

ICIF is a collaboration between researchers from the University of Brighton, University of Bristol, Cranfield University, Southampton University, University of Sussex and University College London.

About Building Better Business Models

The Building Better Business Models for the Digital Economy research project is an EPSRC project, funded under the cross council Digital Economy Theme, that brings together researchers from Cass Business School (City), SPRU, LSE and the University of Pennsylvania, to explore how new business models are disrupting existing industries and how they can be effectively managed.

To arrange further discussion on any of the points raised in this document please contact in the first instance:

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